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Development of “Fission Chamber Free” Fork Detector (FDET) for Safeguards Measures on LWR Spent Fuel Assemblies

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As a part of light water reactor (LWR) spent fuel verification technology improvement, the IAEA developed a Fork Detector (FDET) in which neutron detectors were changed from fission chambers (FCs) to boron-10 (B-10) lined proportional counters in order to avoid the difficulties in the transportation and deployment of fission chambers containing fissile materials.

The validation experiment to investigate the features and performance of a prototype FDET with B-10 counters was carried out at the pressurized water reactor (PWR) spent fuel storage pond of Ulchin nuclear power plant (NPP) in the Republic of Korea in June 2011 in the framework of Member State Support to the IAEA, and the results promised that FDET with shielded B-10 counters could be applied for neutron detection of PWR spent fuel assemblies cooled over 3 years.

The IAEA is currently applying B-10 counter based FDET(B10) for the implementation of safeguards measures on the LWR spent fuel assemblies during the transfer campaign prior to loading into the transfer cask to move from wet to dry storage at the commercial NPP. The traditional fission chamber based FDET(FC) is continuously used as a safeguards measure to resolve core fuel anomalies because the extremely high gamma dose of freshly discharged core fuel assemblies exceeds the application limit of FDET(B10).

Country or International Organization

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